

## QUALITY IMPROVEMENT

# The Impact of an Embedded Oncology Pharmacist in an Outpatient Oncology Center in the Treatment of Hematologic Malignancies

DENISSE MAE TRINIDAD, PharmD, and PUJA R. PATEL, PharmD, BCOP

From Northwestern Medicine Delnor Hospital, Geneva, Illinois

Authors' disclosures of conflicts of interest are found at the end of this article.

Correspondence to: Denisse Mae Trinidad, PharmD, 300 S Randall Rd, Geneva, IL 60134.  
E-mail: dentrinidad37@gmail.com

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## Abstract

**Background:** The growing demand for clinicians in the ambulatory oncology setting to reduce fragmentation of care and improve patient outcomes represents a need for oncology pharmacists as advanced practitioners in the provision of direct patient-centered care. These provisions can include supportive care management, drug-drug interaction evaluation, and selection of appropriate chemotherapy regimens to reduce physician workload in a cost-effective manner, while increasing physician and patient satisfaction. However, robust data are currently lacking to support the impact of pharmacists in the ambulatory oncology setting. The primary objective of this study is to justify the benefit of a full-time clinical pharmacist in the ambulatory oncology setting through documenting pharmacist-driven clinical interventions, correspondence of those interventions with cost avoidance, and perceived benefit from provider and patient satisfaction surveys. **Methods:** In this observational single-center pilot study, pharmacist interventions were documented and quantified from March 4, 2019, to March 9, 2021. This study evaluated the impact of these interventions through correlating cost avoidance and overall patient and provider satisfaction surveys regarding oncology pharmacists embedded in the outpatient clinic. **Results:** During the study period, a total of 545 diverse interventions were made by pharmacists. The estimated cost avoidance during the study period was \$363,760, resulting in a net benefit of \$753,150 per year. Both provider (n = 5) and patient (n = 8) surveys indicated strong agreement to the benefits of an oncology pharmacist's involvement in clinic. **Conclusion:** This study demonstrates the clinical impact, financial benefit, and positive humanistic outcomes of an embedded oncology pharmacist within the ambulatory oncology setting.

The Centers for Disease Control and Prevention and the US Surgeon General both acknowledge that increasing demands for access, safety, quality, and cost in the health-care system in the United States is a challenge, and that patient care services delivered by pharmacists can significantly contribute to reduce fragmentation of care, improve patient outcomes, and increase cost efficiency through physician-pharmacist collaboration (Centers for Disease Control and Prevention, 2013; Giberson et al., 2011). In the 2004 report from the American Society of Health-System Pharmacists detailing the characteristics and trends in pharmacy ambulatory practice, oncology services was the second most prevalent setting, after anticoagulation, for pharmacist involvement in the clinic (Knapp et al., 2005). However, documentation and demonstration of the clinical, financial, and humanistic impact of a clinical pharmacist in ambulatory oncology remains insufficient in published literature. Evidence to support the benefits of a pharmacist as a direct advanced practitioner (AP) is necessary to advance patient-centered care in the continually evolving and complex field of oncology.

Five-year survival rates have more than quadrupled for leukemia, more than doubled for Hodgkin lymphoma (HL), and have increased by about 31% for non-Hodgkin lymphoma (NHL) with the emergence of new therapies (Leukemia and Lymphoma Society, 2019). Despite these promising developments, a study from 2014 predicted there would be a significant shortage in oncologists/hematologists by 2025, resulting in the inability to provide quality care unless there is enhanced productivity (Yang et al., 2014). With the growing demands for clinicians in oncology, this necessitates the expansion of APs, such as pharmacists, to work together for the provision of direct patient-centered care.

Pharmacists in the ambulatory setting can excel in providing patient education, managing adverse effects caused by chemotherapy or disease progression, and assisting with the selection of appropriate regimens and supportive care. However, there is currently a lack of data to support the impact and value this role may have. Shah and colleagues (2006) were one of the first to document considerable clinical contributions, or interven-

tions, of an outpatient clinical pharmacist in direct cancer patient care. Subsequently, further studies have been conducted to demonstrate the impact of pharmacists as APs in the oncology setting and document interventions correlated with clinical, financial, and humanistic outcomes (Alexander et al., 2016; Lam & Cheung, 2016; Ruder et al., 2011; Valgas et al., 2010; Vulaj et al. 2018).

A 2018 study from Randolph and colleagues (2018) looked at three outcomes with documentation of interventions, cost avoidance as a result of each intervention, and patient and staff satisfaction surveys. They documented 962 interventions with a pharmacy resident and central pharmacist over 1 month, which correlated to a cost avoidance of \$282,741 per pharmacist per year for a \$138,441 annual net benefit, and overall positive perceptions of the pharmacy resident. Additionally, a 2020 study from Virani and colleagues demonstrated the clinical and financial impact of a board-certified oncology pharmacist (BCOP) in an outpatient, multiple myeloma clinic with 474 interventions over 39 days for a predictive annual value of \$757,764. A later study in 2020 by Meleis and colleagues further solidified the impact of pharmacists as APs, with 5,091 interventions between nine ambulatory oncology clinical pharmacists over a 6-month time frame while also demonstrating high satisfaction with the pharmacists from a provider/nurse perception. With the increased survival of patients with cancer, complexity of treatment, and anticipated shortage of oncology providers, oncology pharmacists in the ambulatory clinic are ideal to enhance quality direct patient care through diverse interventions.

Given the need for additional evidence of enhanced patient care with the implementation of a clinical oncology pharmacist in the ambulatory setting, the Northwestern Medicine Delnor Cancer Center (NMDCC) conducted an observational single-center pilot study to evaluate the clinical, financial, and humanistic impact of a pharmacist in a clinic for hematology/oncology patients to establish a foundation to justify the benefit of a full-time clinical pharmacist in the ambulatory clinic.

## METHODS

Northwestern Medicine Delnor Cancer Center is an outpatient cancer center located on the cam-

pus of Northwestern Medicine Delnor Hospital in Geneva, Illinois. Comprehensive oncology services are available onsite, with current pharmacists' roles predominantly overseeing admixing and dispensing. During the study period, pharmacists primarily worked with three medical oncologists and two advanced practice nurses (APNs). Consultations for the pharmacist to see the patient collaboratively with the oncologist or APN in the clinic started on March 4, 2019. The pharmacist received consultations at the discretion of the oncologist to follow complex patients who would benefit from closer medical management.

Patients included were newly diagnosed and starting chemotherapy, or recently relapsed and restarting new chemotherapy diagnosed with Hodgkin lymphoma, chronic/small cell lymphocytic leukemia, chronic/acute myeloid leukemia, B-cell lymphomas such as but not limited to diffuse large B-cell lymphoma, follicular lymphoma, and mantle cell lymphoma, and/or myelodysplastic syndromes. Patients enrolled in clinical trials were also included. Patients were excluded if they were unable to schedule appointments on available pharmacist clinic days.

The goal of this pilot was to introduce a new workflow to provide an efficient and safer process for patients receiving chemotherapy. Prior to the pilot, the workflow was that patients would be seen by their oncologist for chemotherapy regimen selection, and the APN would provide chemotherapy teaching, followed by initiation of treatment in the outpatient infusion center (unless chemotherapy modality was solely oral). Patients would follow up with either the oncologist or APN prior to each treatment cycle or as clinically necessary. However, any changes to regimen or dosing per paradigms (e.g., dose-adjusted R-EPOCH) or due to adverse drug effects (e.g., toxicity dose adjustments) required the clinician to update the treatment plan and communicate any adjustments to the infusion pharmacists and nurses. Consequently, this new proposed workflow would allow the embedded clinical pharmacist to make these changes in the treatment plan in real time and document the changes in the electronic medical record (EMR) for the infusion pharmacists and infusion nurses. Overall, the addition of a pharmacist in clinic would ultimately increase physician

efficiency and decrease delay in patient care in the infusion center with enhanced communication and documentation pathways.

Prior to this pilot, the clinical pharmacists were based in the infusion pharmacy where their primary role consisted of verifying and dispensing chemotherapy. At the time of the pilot, NMDCC had 2.0 pharmacist full-time equivalents (FTEs) in the infusion pharmacy. To incorporate a clinical oncology pharmacist as a direct point of contact with patients, an additional BCOP was provided a 0.5 clinic day per week (0.1 FTE) to see patients collaboratively or independently. Once a postgraduate year 1 (PGY1) pharmacy residency was started at the site, a resident was able to offer an additional 1.0 clinic day, yielding a total of 1.5 clinic days per week from January 7, 2021, to March 9, 2021.

After a provider consult, the pharmacist and scheduling team synchronized future appointments with the patient to correspond with both the pharmacists' and providers' schedules. The first point of contact with the patient was during the chemotherapy teaching appointment, prior to the first chemotherapy infusion or initiation of oral chemotherapy, and follow-up collaborative appointments were synchronized to the pharmacists' clinic days. Furthermore, the pharmacist could see the patients independently in the infusion clinic on non-assigned clinic days.

Interventions were categorized into nine categories with associated cost avoidance based on the study conducted by Randolph and colleagues (2018; Table 1). Categorization of each intervention was subject to the discretion of the pharmacist to classify each intervention into a single category. While interventions could fall into more than one category, it was the responsibility of the pharmacist to identify which single category to document the intervention made to prevent duplication of interventions. Documentation after patient-pharmacist interactions were recorded as a progress note in the patient's EMR. The pharmacist tracked interventions in a password-protected Excel worksheet to monitor patient, provider, appointment type, intervention types, and time spent per intervention while ensuring data confidentiality. Details are further elaborated in Appendices A and B. Times documented included any preparation needed prior to making the intervention, see-

**Table 1. Intervention Categories With Associated Cost Avoidance and Time Utilization**

Intervention type	Intervention definition	Cost avoidance values	Pharmacist interventions	Cost avoidance (\$US) <sup>a</sup>	Time spent per intervention class (min)	Time spent per intervention class (hr)
Adverse event	Managing unwanted or harmful effect of medication therapy	\$536	25	\$13,400	460	7.6
Drug interaction	Monitoring or adjusting medications based on a change in the action or side effects of a drug caused by concomitant administration with a food, beverage, supplement, or another drug	\$317	77	\$24,409	1,570	26.1
Lab monitoring	Ordering and following up on lab drawn results that require close monitoring for dose adjustment, toxicity management, or treatment efficacy assessment	17.01:1 benefit:cost ratio	53	\$15,203	715	11.9
Medication reconciliation	Reconciling and documenting a patient's most current active medication list	\$50/20 min	35	\$1,038	415	6.9
Order clarification	Entering changes to chemotherapy treatment plans or adjustments to non-chemotherapy related medications. Includes sending prescriptions to pharmacy.	\$50/10 min	75	\$6,250	1,250	20.8
Patient education/counseling	Continued teaching to enhance understanding of medication or disease state to patient, family/caregiver	5.73:1 benefit:cost ratio	48	\$6,769	945	15.8
Drug information	Informal/verbal drug information questions that rely on pharmacy expertise or review of primary literature	11.89:1 benefit:cost ratio	1	\$892	60	1.0
Supportive care <sup>c</sup>	Recommending pharmacological or non-pharmacological management strategies regarding one of the nine subcategories <sup>c</sup>	\$1,479	200	\$295,800	2,595	54.0
Transitions of care	Conducting coordination and continuity of care for patient between different healthcare specialties or inpatient vs. outpatient	ND	31	-	375	6.3
<b>Total</b>			<b>545</b>	<b>\$363,760</b>	<b>8,385</b>	<b>140.0</b>

Note. <sup>a</sup>Yearly cost avoidance for full-time 1 FTE clinical pharmacist:

[US\$ (\$363,760 for 2 yr cost avoidance)/2 years<sup>b</sup>/(52 wk × 8 hr/wk = 416 hr)] × 40 hr/wk × 52 wk/yr = \$909,400  
 \$909,400 - (\$125,000 × 1.25) = Net benefit \$753,150 per yr  
 (\$125,000 × 1.25)/(52 wk × 40 hr/wk) = An hourly rate of \$75.12

<sup>b</sup>Randolph et al. (2018)

<sup>c</sup>Supportive care subcategorized in Figure 1.

ing the patient to make the recommendation, and any time spent afterward for appointment tasks (e.g., sending a prescription to the pharmacy, adjusting the treatment plan, etc.).

Once a patient was nearing the end of therapy, a survey was provided to evaluate the patient’s personal perceptions and experiences of the clinical pharmacists in direct patient care. A survey was also given to the oncologists and APNs after 1 year of piloting this workflow to assess the perceptions of other health-care providers on the team. Anonymous surveys were developed based on surveys used in studies by Ruder and colleagues (2011), Delaney and colleagues (2008), and Randolph and colleagues (2018).

The primary objectives of this study were to (1) document the number of interventions made by a pharmacist in the ambulatory oncology setting, (2) correlate the resulting financial impact of interventions by calculating the total cost avoidance, and (3) assess patient and provider satisfaction regarding the pharmacist in the treatment team.

The secondary objectives of this study were to (1) evaluate the subcategories of supportive care and order clarification interventions, (2) identify the number of visit types conducted, (3) average the time spent per intervention, and (4) determine provider time saved.

**Statistical Analysis**

Descriptive statistics were used to measure and classify the number of interventions made by the pharmacist, and categorical variables were reported as both totals, averages, and percentages.

**RESULTS**

Baseline characteristics of the patients seen by the pharmacists in clinic are displayed in Table 2. The clinical pharmacist made 474 interventions from March 4, 2019, to March 9, 2021, and the PGY1 resident made 71 interventions from January 7, 2021, to March 9, 2021, for a total of 545 interventions conducted over 269 clinic visits for 36 unique patients.

The cost avoidance values and time spent per intervention class are displayed in Table 1. Cost values and calculations were based on the study conducted by Randolph and colleagues (2018). Within the 1.5 clinic days between the pharmacist and pharmacy resident and an estimation of work

**Table 2. Baseline Patient Characteristics (n = 36)**

Characteristics	n (%)
Sex	
Female	10 (27.8)
Male	26 (72.2)
Age	
< 65	15 (41.7)
65–75	15 (41.7)
> 75	6 (16.7)
Race	
Caucasian	34 (94.4)
African American	1 (2.8)
Hispanic	1 (2.8)
Cancer type <sup>a</sup>	
CLL	14 (38.9)
CML	4 (11.1)
DLBCL	6 (16.7)
FL	2 (5.6)
HL	6 (16.7)
MZL	1 (2.8)
MCL	2 (5.6)
MDS	1 (2.8)
Number of previous chemotherapy treatments for hematologic malignancies	
0	29 (80.6)
1	4 (11.1)
≥ 2	3 (8.3)

*Note.* CLL = chronic lymphocytic leukemia; CML = chronic myeloid leukemia; DLBCL = diffuse large B-cell lymphoma; FL = follicular lymphoma; HL = Hodgkin lymphoma; MZL = marginal zone lymphoma; MCL = mantle cell lymphoma; MDS = myelodysplastic syndromes.

conducted on non-assigned clinic days, the time spent per week for pharmacist interventions over the 2-year study period was estimated to be about 8 hours per week. Cost avoidance was calculated per hour and extrapolated to a yearly estimate based on a 40-hour work week with 52 weeks per year. The clinical pharmacists were able to create a cost avoidance of \$363,760 in clinic, which equated to a cost avoidance of \$909,400 per year when extrapolated. The cost to employ one FTE (\$125,000 salary × 1.25 for benefits) pharmacist



subtracted from this total resulted in a net benefit of \$753,150 per year, further validating the financial benefit of a pharmacist in clinic.

Over the 2-year study period, eight patient surveys and five provider surveys were distributed and collected. Results of the survey, presented in Tables 3 and 4, were compellingly positive with average responses between the patients and providers strongly agreeing in nearly all categories. Most notably, the patients strongly agreed they would request a pharmacist remain part of the medical-oncology team, and providers strongly agreed that the presence of a pharmacist had a positive impact, improved clinical outcomes, and highlighted the importance of real-time decision making. Survey responses included phrases such as, “advice provided was invaluable,” “highly recommended,” “was a critical member of the medical team,” and “improved my treatment experience.”

Of the 545 interventions, the largest pharmacist impact was in supportive care, with 200 (36.6%) interventions. Pharmacist supportive care interventions were further divided into nine subcategories (Figure 1): gastrointestinal (n = 46),

anti-infective (n = 37), other (n = 30), immunization (n = 28), tumor lysis syndrome (n = 25), cancer-associated venous thromboembolism (n = 10), granulocyte colony-stimulating factor related (n = 10), nausea and vomiting (n = 8), and peripheral neuropathy (n = 6). This demonstrates the diversity of symptom management a pharmacist is able to provide, which aids in decreasing the workload for an oncologist or APN.

The second category with the most interventions (Figure 2) was drug interactions, with 77 (14.1%) that could require medication management (dose modification, alternative therapy, specific administration instructions, etc.) or monitoring (toxicities, side-effects, labs, etc.). Drug interactions were typically identified by the pharmacists, who then alerted the provider and made recommendations on management based on severity of the interaction.

Order clarification subcategorized into chemotherapy vs. non-chemotherapy was the next category in which pharmacists were able to intervene, with 51 (68%) and 24 (32%) interventions, respectively (Figure 3). These chemotherapy order

**Table 3. Clinical Pharmacy Services Patient Satisfaction Survey (n = 8)**

	Median Likert scale (range) <sup>a</sup>
I received useful information from the pharmacist.	5 (5)
I felt the presence of a pharmacist was helpful during my consultations with the physician/nurse practitioner.	5 (4-5)
I found it useful for the pharmacist to come discuss my treatment with me during my oral chemotherapy/infusion visits.	5 (4-5)
Additional drug-related questions were answered by the pharmacist to my satisfaction.	5 (4-5)
If your pharmacist recommended medication or remedies to you for side effects of chemotherapy, they were beneficial.	5 (3-5)
If I had a choice, I would request a pharmacist remain part of the medical-oncology team.	5 (4-5)

*Note.* <sup>a</sup>The Likert scale is a 5-point scale with 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

**Table 4. Provider Survey of Clinical Pharmacist (Physician n = 3; APN = 2)**

	Median Likert scale (range) <sup>a</sup>
The pharmacist is resourceful and available to answer drug information questions in a timely and accurate manner.	5 (5)
Pharmacist's knowledge with new drugs and/or emerging trends in the field of oncology is helpful.	5 (5)
I used the pharmacist as a resource more often when they are present in clinic.	4 (3-5)
The pharmacist is able to make appropriate recommendations/interventions.	5 (4-5)
Presence of a pharmacist had a positive impact and improved clinical outcomes related to patients.	5 (5)
I feel the presence of a pharmacist in the medical oncology clinic full-time would be valuable.	5 (4-5)

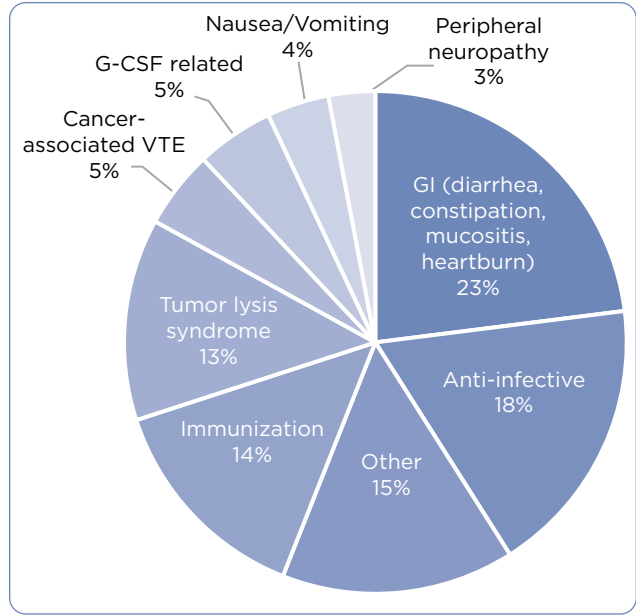
*Note.* <sup>a</sup>The Likert scale is a 5-point scale with 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

clarifications required the pharmacist to update the treatment plan in the EMR before sending the plan to the oncologist for a required co-signature. This further enhances the efficiency in which a patient is able to transition into their next cycle of chemotherapy by minimizing delays in updating the treatment plan and communication to the infusion center. Additionally, for non-chemotherapy order clarifications, the pharmacist was able to place orders and send prescriptions to local pharmacies for the patient, ultimately reducing an additional task from the workload of the oncologist or APN. With 36 unique patients, the pharmacist was involved in managing intravenous, oral, and investigational chemotherapy regimens (Figure 4).

Overall, 545 interventions were made during the study. A total of 269 appointments resulted from 167 collaborative appointments with the provider or APN, 77 independent visits, and 25 non-visit interventions. Time spent on interventions correlated with 8,385 minutes, with an average of 15 minutes per intervention, which estimates 140 hours of provider time saved.

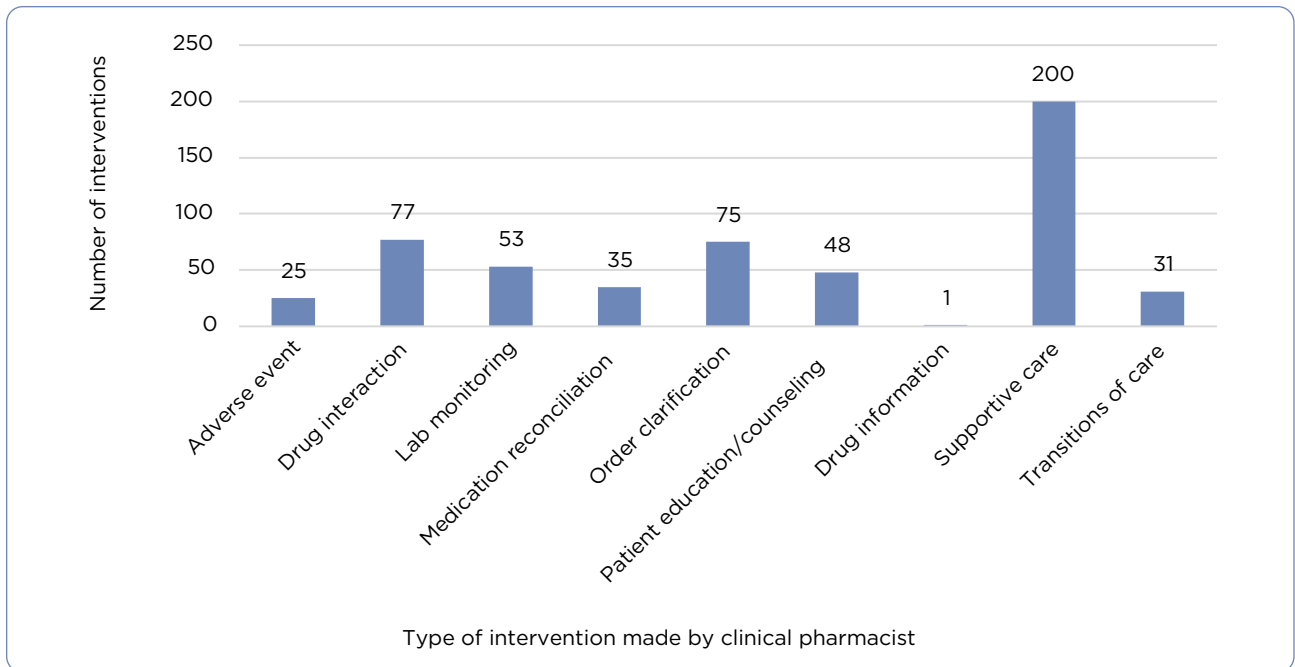
**DISCUSSION**

This observational pilot study demonstrates the benefits of incorporating a clinical pharmacist in the ambulatory oncology setting. An ambula-

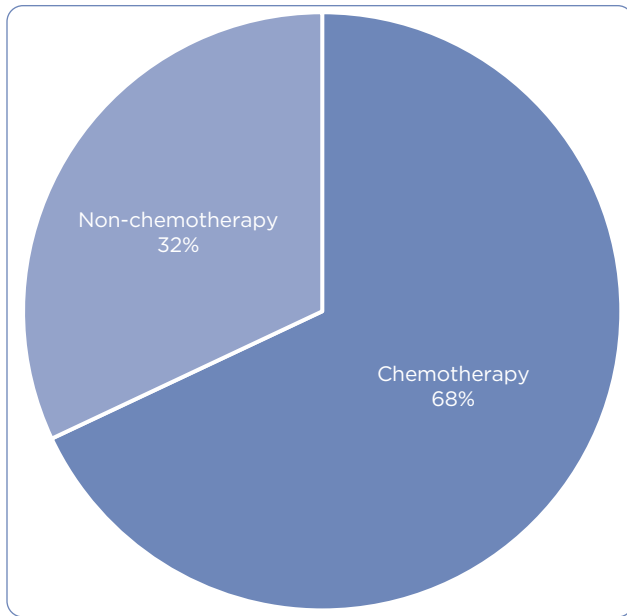


**Figure 1.** Percentage of types of supportive care subcategories (n = 200).

tory oncology pharmacist provides diverse skills in managing oncology patients as seen in the 545 interventions over the course of the study. These proactive services provided by the pharmacist demonstrated overwhelming positive patient and provider satisfaction as well as an impactful net benefit of \$753,150 per year.



**Figure 2.** Pharmacist interventions over 2 years.



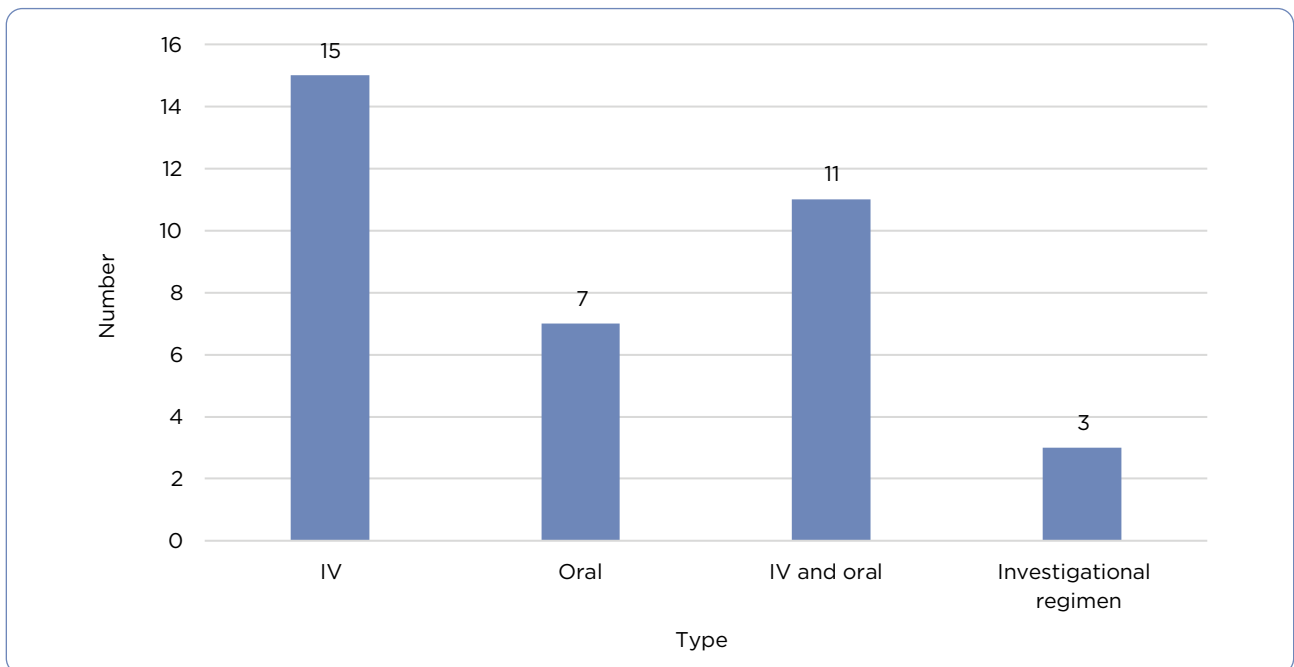
**Figure 3.** Percentage of types of orders clarified (n = 75).

Randolph and colleagues (2018) concluded that with the inclusion of a designated clinical pharmacist, cost avoidance of 962 interventions was estimated at \$282,741 per pharmacist per year yielding a net benefit of \$138,441. Similarly, Virani and colleagues (2020) implemented a clinical pharmacist specialist within the multiple myeloma

clinic resulting in 474 interventions representing a predicted annual value of \$757,764. Our study findings with 545 documented pharmacist interventions and corresponding net value of \$753,150 aligns with current limited available values on oncology pharmacists' clinical and financial impact within published literature and to date has the longest study duration of 2 years.

Additionally, Randolph and colleagues (2018) averaged a 5 (strongly agree) on the Likert scale for all survey questions within their study. Meleis and colleagues (2020) showed responses of 98% and 97% of strongly agree or agree on the Likert scale that access to a clinical pharmacist in the providers' clinic improved patient care and the clinical pharmacist in the provider's clinic is a valuable member of the clinical team, respectively. From a patient and provider satisfaction perspective, our results parallel these studies in demonstrating remarkably positive perception and feedback regarding embedded oncology pharmacists in clinic.

Limitations to this study included availability of the clinic pharmacist given the 1.5 clinic days a week and interactions with patients on non-clinic days. Any interventions made during these non-clinic days were still recorded, which underestimates how many interventions were made in a 2-year period for the defined 1.5 clinic days per week. Non-clin-



**Figure 4.** Types of chemotherapy regimens (n = 36).



ic day interventions were largely documented for patients starting venetoclax (Venclexta) and who were ramping up on the dose during appointments in the infusion center. The pharmacists provided patient-specific ramp-up calendars and counseled patients with demo starter kits to provide direct patient care during this process that is otherwise conducted in an indirect manner. Further underestimation of the cost of interventions and impact exist due to the lack of correlating financial data for transitions of care (not identified in the Randolph study). The pharmacists excelled in transitions of care, as they are able to address questions regarding medications not directly related to their oncology care, identify and reconcile discrepancies, and the PGY1 resident was able to see patients during their hospital admissions for inpatient chemotherapy, a unique benefit of the resident's longitudinal rotation. There is also an underrepresentation in patient satisfaction surveys due to the inability to consistently distribute and collect surveys for those lost to follow-up (e.g., patient deceased, moved, or completed therapy on a non-clinic day).

The transition from the clinical oncology pharmacist's role from the infusion pharmacy to the clinic resulted in the need for an additional 0.1 FTE pharmacist in NMDCC. Additionally, the transition required training provided by the clinical pharmacist for the physicians, APNs, patient services representatives, triage nurses, scheduling team, and call center to include the new role of the clinical pharmacist in their workflow. Not only did this introduce more collaboration of direct and indirect health care team members, but it aids in the ever-shifting mindset of the role of the pharmacist (HOPA, 2019). This pilot evolved the role of the pharmacist in the cancer center and their established responsibilities on the infusion side and further developed the role of a pharmacist as an AP who is able to provide direct patient care through clinic management services such as managing symptoms and providing supportive care or adjusting/ordering chemotherapy (Ignoffo et al., 2016; HOPA 2019).

The results of this pilot parallel results from similar studies, which further validate the outcomes demonstrated despite limitations. Based on the results of this pilot, NMDCC is progressing toward an expansion of ambulatory oncology pharmacy services, including the development of a formal collab-

orative practice agreement given that pharmacists in Illinois do not have prescriber status and pharmacists at NMDCC did not use any institutional charge codes for the services provided. While the justification for one full-time oncology pharmacist exists as exemplified by the positive impact of pharmacy services on the aforementioned clinical, financial, and humanistic outcomes, barriers to adoption remain in place, such as absence of prescriber status for reimbursement for clinical services provided by pharmacists and unregulated metrics. As such, more studies should be conducted to add to the oeuvre of literature to not only further establish the clinical and financial benefits oncology pharmacists in the ambulatory setting provide, but also to aid in outlining the process and support for implementation aspects. Future directions to further perpetuate expansion of pharmacy services can evaluate reduced emergency department visits, improvement in symptom scores, and billing revenue generation.

## CONCLUSION

The benefits of a clinical pharmacist in the ambulatory oncology setting are demonstrated in this observational pilot study through a total of 545 interventions made in the clinic by a pharmacist over the 2-year time frame, which corresponds to a net benefit of \$753,150 per year. This study demonstrated the impact of diverse pharmacist-driven clinical interventions and illustrated the financial and humanistic value of an embedded pharmacist in ambulatory oncology. ●

## Disclosure

Dr. Trinidad has no conflicts of interest to disclose. Dr. Patel has served on advisory boards for AstraZeneca, Exelixis, Genentech, Heron Therapeutics, and Mylan.

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**Appendix A. Example of Data Collection Sheet for Intervention Documentation**

Patient	Date	Oncologist	Visit type	Intervention type	Supportive care	Order clarification	Intervention details	Time	Notes	BCOP or resident

**Appendix B. Example of Data Collection Sheet for Supportive Care and Order Clarification Subcategories**

SC: NV	SC: GI <sup>a</sup>	SC: Anti-infective	SC: G-CSF related	SC: Immunization	SC: CA VTE	SC: TLS	SC: Peripheral neuropathy	SC: Other	OC: Chemotherapy	OC: Non-chemotherapy

Note. SC = supportive care; OC = order clarification; NV = nausea and vomiting; G-CSF = granulocyte colony-stimulating factor; CA VTE = cancer-associated venous thromboembolism; TLS = tumor lysis syndrome.  
<sup>a</sup>diarrhea, constipation, mucositis, heartburn